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MECHANISM FOR SURFACING ARTICLES IN FELT OR OTHER MATERIAL

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Fig. 1

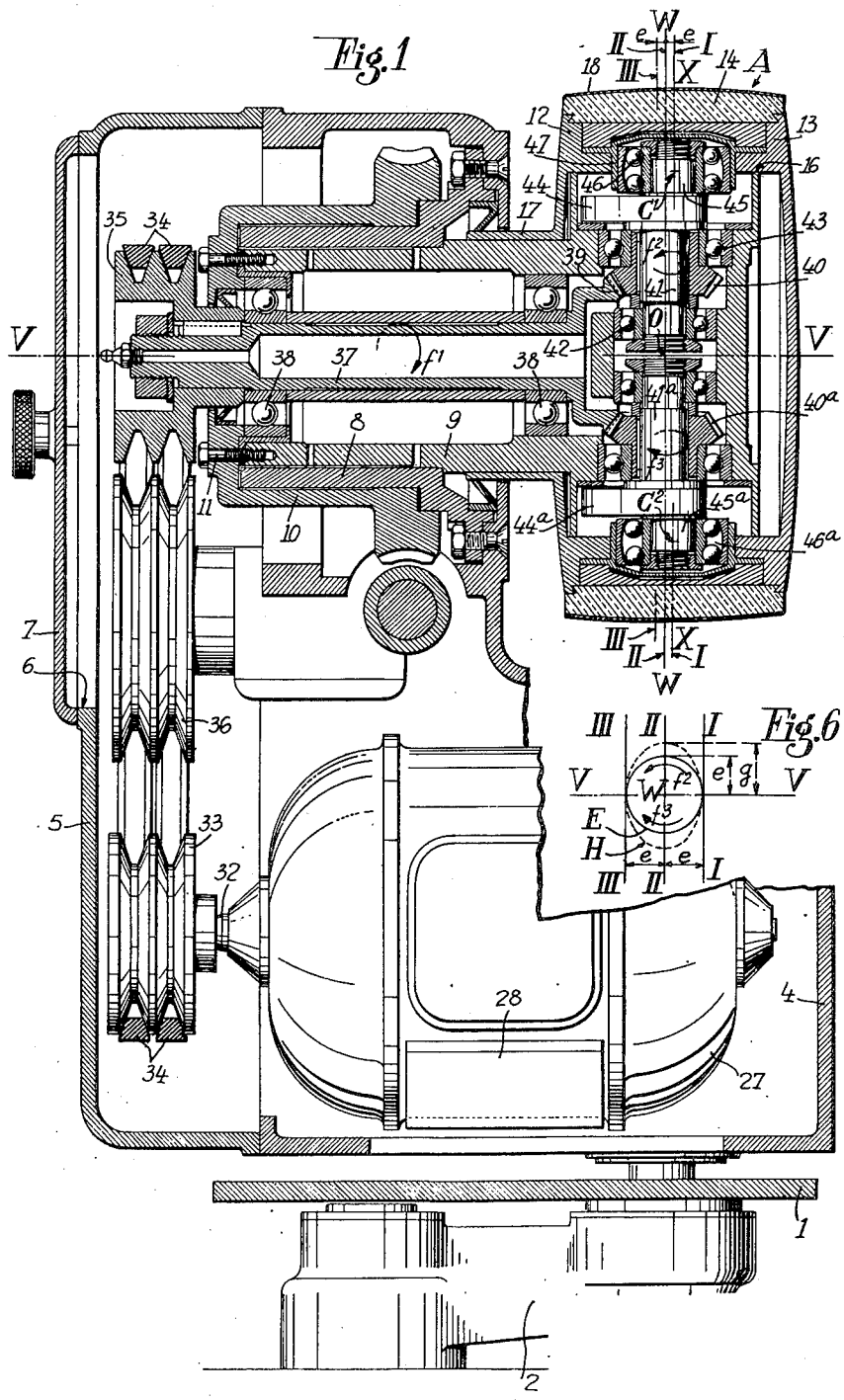


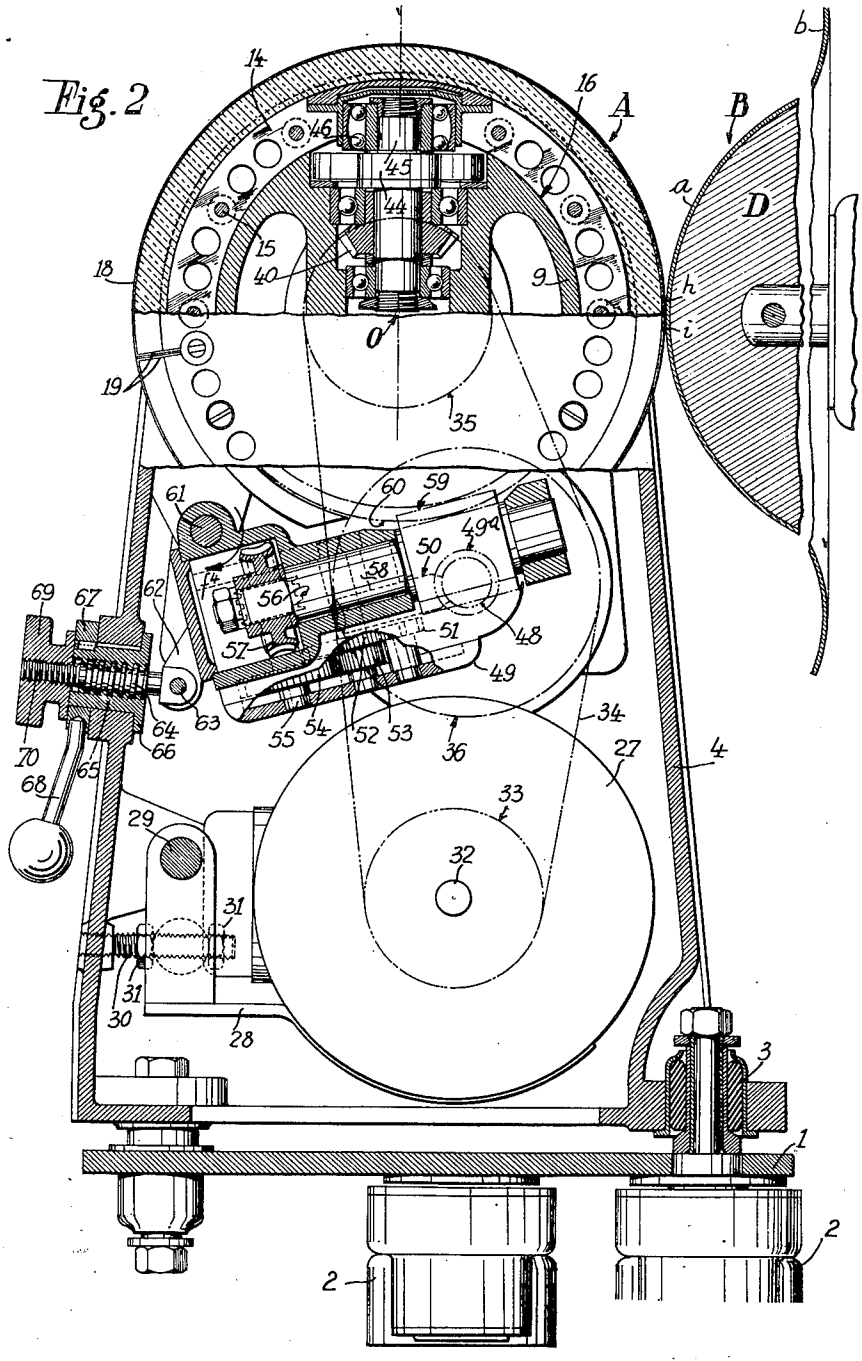
Fig. 6

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Fig. 2



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Fig. 3

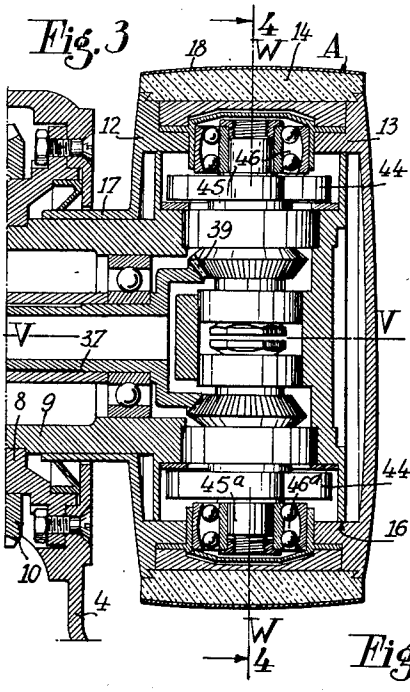


Fig. 4

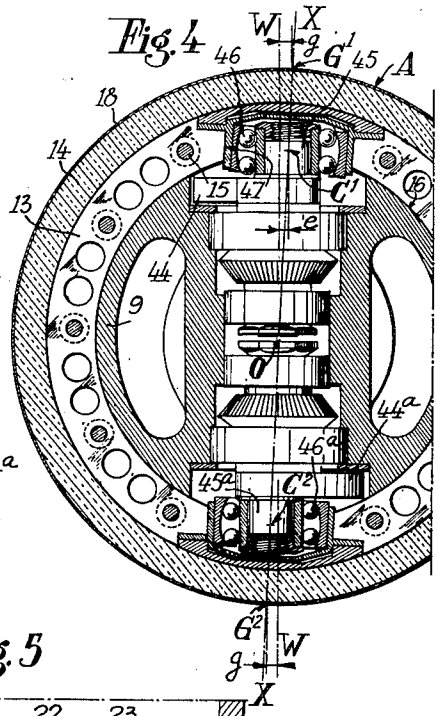


Fig. 5

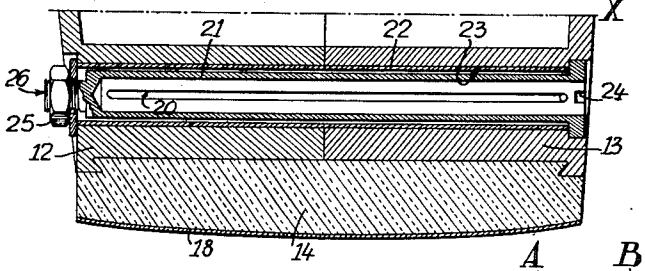


Fig. 7

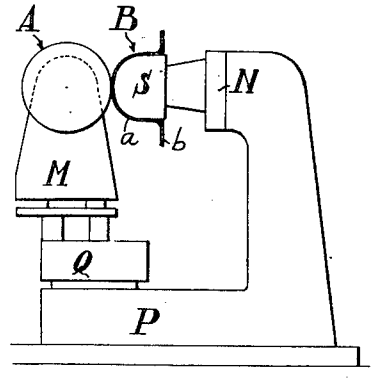
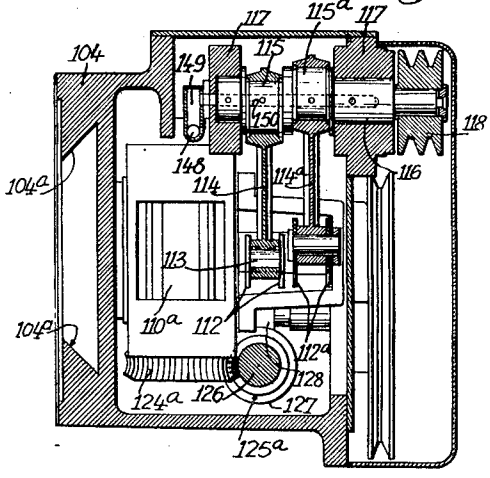


Fig. 9

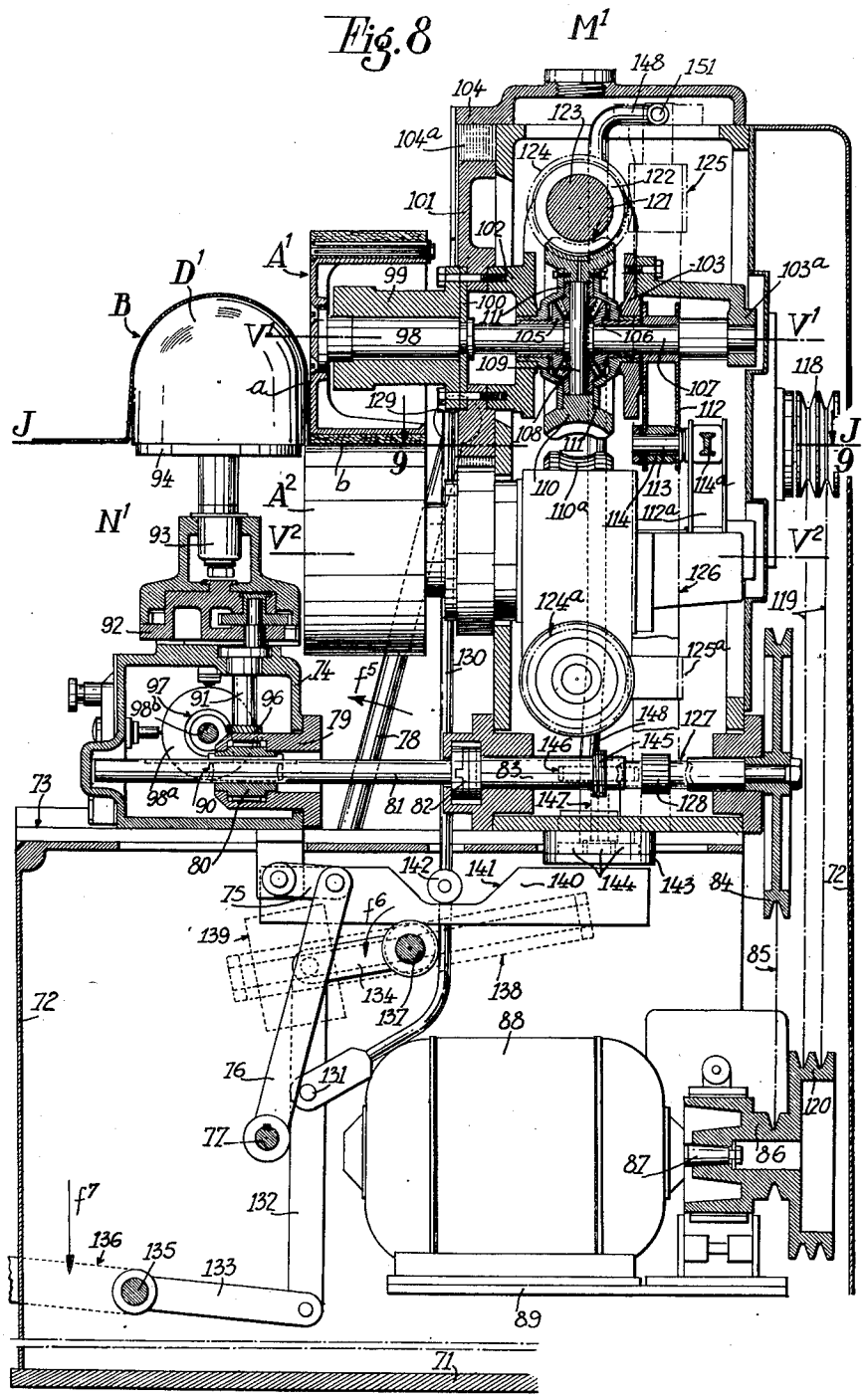


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MECHANISM FOR SURFACING ARTICLES IN FELT OR OTHER MATERIAL

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Fig. 8



United States Patent Office 2,792,162 Patented May 14, 1957

2,792,162

MECHANISM FOR SURFACING ARTICLES IN FELT OR OTHER MATERIAL

Marcel Cassé, Essonnes, France

Application March 9, 1953, Serial No. 341,215

Claims priority, application France November 7, 1952

17 Claims. (Cl. 223—20)

The present invention relates to surfacing by pumicing, sand papering, polishing, friezing, grinding and like finishing operations of articles in material such as felt, cloth, leather, wood or metal, the article being in the form of, for example, a hat body for the hat making industry or an article on the point of being completed.

Machines capable of carrying out such work are known, and in particular sanding heads are known in the hat making industry, the work being performed by the action on the article of a tool whose surface is covered with an abrasive or similar means and which is subjected to a high frequency reciprocatory movement. Each of the points of this surface has a trajectory of small amplitude which is preferably a circle, an ellipse or like curve when the work performed is polishing or sanding. For some operations, such as glossing hats by rubbing the latter with dry or greasy cloth, commonly known in the American hat industry as "ragging," the path of movement may be rectilinear.

In these machines, the wear of the working surface brings about a gradual decrease in its efficiency and replacement of the abrasive surface is necessary. In the known machines replacement is generally only possible by stopping the machine, resulting in irregular and interrupted work.

Automatic sanders have, however, been devised for the hat making industry in which a band of abrasive paper constitutes the working surface. A part of this band is stretched over a sanding block subject only to high frequency reciprocatory movements, and this band is unwound at one of the ends of the block from a roll provided with a brake, the band being made to move over the block at the other end of the latter by a continuous or interrupted drive.

The brake and the drive secured to the block are complicated, easily broken, troublesome in operation and are subject to considerable forces of inertia since they are carried by the sanding block. Further, they cannot be greased without soiling the hat bodies being treated and, lastly, they do not hold the paper well, especially when the block has a substantially circular motion.

The invention has for its object to provide a mechanism for the surfacing of felt or other material, so improved as to remedy the above mentioned disadvantages. This mechanism comprises a support provided with an abrasive member fixed to but removable from this support, the latter having such size that its available surface is much greater than its area of contact with the article on which it works and being combined with two driving devices which impart to it, the first device, a high frequency and low amplitude reciprocatory movement for moving this face in contact with the article and, the second device, a slow movement for replacing the contacting face, after wear of the portion utilized, by another portion of said available surface.

In a preferred embodiment, said support is a cylindrical drum and the driving devices are adapted so as to impart to it, by means of one device, a rapid alternating movement of translation along its axis and/or of rotation about said axis so that all the parts of its surface describe identical trajectories of small amplitude and, by means of the other device, a slow movement of continuous rotation about said axis of the drum.

The invention has for further object to provide a machine for surfacing felt and other material provided with at least one mechanism of the abovementioned improved type.

Other features will become apparent from the ensuing description.

In the accompanying drawings given solely by way of example:

Fig. 1 is a vertical longitudinal sectional view through the axis, of the cylindrical drum constituting the tool, of a mechanism improved in accordance with the invention and suitable especially as a sander for felt hats.

Fig. 2 is an end view thereof with fragmentary sectional views.

Fig. 3 is a diametrical sectional view of a sanding tool similar to that represented in Fig. 1, this tool being in the position it assumes after a rotation of 90° of two radial drive shafts disposed in this tool.

Fig. 4 is a cross-sectional view along line 4—4 of Fig. 3.

Fig. 5 is a fragmentary cross-sectional view of the tool showing the fixing device for the band constituting the abrasive member.

Fig. 6 is a diagram showing to a larger scale and in projection on the same plan the trajectories described by two points of the tool mentioned hereinafter.

Fig. 7 is a diagrammatic arrangement showing a possible adaptation of the mechanism illustrated in the preceding figures in a sanding machine for hat crowns.

Fig. 8 is a longitudinal vertical sectional view of another machine capable of being used in particular for the sanding of hat brims and comprising a modification of the sanding mechanism.

Fig. 9 is a fragmentary horizontal sectional view along line 9—9 of Fig. 8.

Referring to the embodiment of the invention represented in Figs. 1 to 5, the mechanism according to the invention comprises a horizontal plate 1 adapted to be secured to any suitable support 2 of the machine in which the mechanism is incorporated. On the plate 1 is secured by resilient means 3 a casing 4. This casing is provided with a side cover 5 in which is provided an aperture 6 with a closing panel 7, this cover 5 and the panel 7 enabling easy access to be had to the devices housed within the casing 4.

In this casing is rigidly fixed a bearing 8 whose inner and outer faces are cylindrical and coaxial with the axis VV. On this bearing 8 is mounted, rotatable about the axis VV, a hub or rotor comprising the combination of an inner cylindrical piece 9 and an outer piece 10, also cylindrical, connected together by means of screws 11 (Fig. 1).

The cylindrical piece 9 is extended beyond the bearing 8 externally of the casing 4, and on its extension, which has a larger diameter than the portion constituting the hub, is rotatably and slidably mounted, coaxial with the axis VV, the tool A, for example a sanding tool, adapted to surface an article constituted for instance by a crown *a* of a felt hat B composed of this crown *a* and a brim *b* and carried by a support D.

In the illustrated example, the tool A consists in the combination of two side-plates 12 and 13, and a rim 14, the unit being held together by means of bolts 15 (see Figs 2 and 4).

The drum thereby obtained is centred, firstly, on the outer cylindrical face 16 of the extension of the piece 9 and, secondly, by means of a skirt 17 integral with the side-plate 12 on the hub portion of the piece 9.

An abrasive band 18 is pulled taut over the rim 14 and is fixed thereto in a removable manner, for example as shown in Figs. 2 and 5. The two ends 19 of this band are passed through a slit in the drum and are then engaged in a slot 20 of a tubular key 21 (Fig. 5), rotatively mounted in a sleeve 22 itself lodged in two coaxial apertures 23 provided in the side-plates 12 and 13. The key 21 may be rotated by means of, for example, a screwdriver slot 24 provided in one of its ends. This enables a portion of the abrasive band 18 to be held between the circular key 21 and the sleeve 22. The assembled key and band may be thereafter locked by means of a nut 25 screwed on a threaded end 26 of the tubular key 21.

The mechanism is completed by two driving devices. The first device permits rapid oscillatory movements of rotation about the axis VV and translation along this axis to be imparted to the tool A so that all the points of its outer surface, i. e. the abrasive working surface, describe identical closed trajectories which will be hereinafter described. The second device permits a slow continuous movement about the axis VV to be imparted to the unit comprising the hub 9—10 and the tool A.

These two driving devices are driven by a single electric motor 27 disposed at the lower part of the frame 4 on a support 28. This motor is pivotally mounted about a pin 29 (Fig. 2) parallel to the axis VV and the angular position of this support is adjustable by means of a screw 30 and two nuts 31. On the shaft 32 of this motor is keyed a grooved pulley 33 that V-belts 34 connect to a pulley 35. The V-belts pass over an intermediate pulley 36.

The pulley 35 forms part of the first driving device adapted to impart the rapid oscillatory movement to the tool A. This pulley 35, driven at substantially the same speed as the motor, is keyed on a shaft 37 rotatively mounted so as to rotate about the axis VV in the part 9 of the hub, through the medium of ball bearings 38.

At the tool A end of the shaft 37, the latter terminates in the form of a bevel gear 39 which meshes, at two diametrally opposed points, with two bevel pinions 40 and 40^a respectively keyed on two shafts 41 and 41^a disposed along an axis WW perpendicular to the axis VV of the hub.

These two shafts 41 and 41^a are journalled through the medium of ball bearings 42 and 43 (Fig. 1) in bores provided in the extension of the piece 9. Adjacent these ball bearings, these shafts are extended by eccentric counterbalances 44 and 44^a and by crankpins 45 and 45^a each having the same throw e as these counterbalances and being diametrally opposed to its conjugate counterbalance.

A spherical or self-aligning double-row ball bearing 46, 46^a is mounted on each of these crankpins 45 and 45^a, the spherical inner face of the outer ring having its centre situated at C^1 or C^2 on the axis of the corresponding crankpin.

The outer ring of each bearing is fitted, through the medium of a cup 47 into a bore provided in the drum assembly constituting the tool A.

The shafts 41 and 41^a are so arranged that the straight line XX, which passes through the centres C^1 and C^2 of the two spherical bearings, is always perpendicular to the axis VV of the hub.

With this arrangement, if the shaft 37 rotates in the direction of arrow f^1, the shafts 41 and 41^a rotate in opposite directions, indicated by arrows f^2 and f^3 (Fig. 1). Thus, the centres C^1 and C^2 of the two spherical bearings describe about the axis WW a circle of radius e in the direction of arrows f^2 and f^3.

These two circles are shown at E in Fig. 6 to an enlarged scale and projected on a single plane perpendicular to the axis WW.

The tool A is therefore subject to two displacements: one of translation and of amplitude $2e$ along the axis VV, the plane which contains the line XX and is perpendicular to the axis VV being displaced between the two extreme positions I—I and III—III (Figs. 1 and 6); and the other displacement being of oscillation about this axis VV, the maximum amplitude of displacement on either side of the plane containing the axis WW and VV being equal to e for the centres C^1 and C^2, and g for the points G^1 and G^2 (Fig. 4) where the line XX intersects the peripheral face of the tool, g being equal to

$$e \times \frac{OG^1}{OC^1}$$

Thus all the points of the peripheral face of the tool describe a curve H (Fig. 6) which is very similar to an ellipse and has a minor axis parallel to VV and equal to $2e$, and a major axis equal to $2g$.

The second device for imparting a slow movement of uniform rotation to the tool A, comprises the pulley 36 which is driven by the shaft 32 of the motor 27 in the same way as the pulley 35 of the above described device. This pulley 36 is keyed on a shaft 48 which is journalled in a casing 49 of a speed reducer which also acts as a clutch engaging device.

As a speed reducer, this device comprises a gear train including a worm 49^a (Fig. 2) that forms part of or is connected to the shaft 48, a worm wheel 50 in mesh with this worm and driving, through the medium of four gear pinions 51, 52, 53 and 54, a shaft 55. This shaft 55 carries a worm in mesh with a worm wheel 57 keyed on a shaft 58. This shaft carries a second worm 59 which is in mesh with a worm wheel 60 provided on the hub 10.

For purposes of clutch engagement, the casing 49 is pivotally mounted on a pin 61 and is provided with a foot 62 upon which is jointed about a pin 63 parallel to the axis VV, a screw 64 which is free to move axially but cannot rotate. On this screw is screwed a nut 65 which may be rotated in the wall of the casing 4 but cannot move axially, it being held by the combination of a flange 66 provided on this nut 65, and a ring 67 keyed on this screw and fixed to an operating lever. A locknut 69, screwed on a second threaded portion 70 of the screw 64 that has a different pitch, enables the assembly to be locked together.

Thus, after unscrewing the lock nut 69, it suffices to turn the nut 65 by means of the lever 68 to cause the casing 49 and the whole of the speed reducing mechanism to pivot about the pin 61. By rotating the casing 49 in the direction of arrow f^4 (Fig. 2), the worm 59 may be separated from the toothed ring 60. After the clutch has thus been disengaged, the rotor 9—10 and the tool A may be rotated if required, for instance for attaching the abrasive band to the band tightening and fixing device.

The mechanism operates in the following way:

When the motor 27 is started up, it drives, through the medium of the pulley 33 and the V-belts 34, the two pulleys 35 and 36 pertaining to the two devices.

One of these devices imparts to the tool A a rapid vibratory movement in the course of which all the points of its surface describe a closed curve identical to the previously mentioned curve H (Fig. 6). This is especially the case for all the points in the region of contact *hi* between this tool and the work B (Fig. 2). The number of cycles per minute is advantageously of the order of 3,500.

The other device imparts to the hub (9, 10) and the tool A a slow rotary movement about the axis VV, for example at the rate of one rotation in two hours so as to continually renew the portion of the abrasive paper 18 in contact with the work B in the working region *hi*.

All the portions of this band come then into contact with the work B. The uniformity of the work is, therefore, ensured until the band has undergone a complete rotation. At the end of this rotation, the band 18 may be renewed.

The counterbalances 44 and 44a make it possible to completely balance about the axis WW not only the weight of the crankpins on the crank shaft and the spherical bearings, but also the weight of the parts of the drum assembly in the region of the centres of the spherical bearings, which parts describe curves comprised between the circle E and the curve H.

The reactions of inertia of the eccentric pieces and a part of the movable drum assembly are, then, balanced and reduce the stresses on the hub (9—10) on the support.

In the embodiment just described, the drum assembly forming the tool is combined with two driving shafts 41, 41a, but it will be understood that only one of these shafts may easily be used, or on the other hand more than two shafts angularly arranged around the hub may be used.

Further, it is clear that if the tool is required to have a great length, other tools identical to that described could be placed end to end to the right of the Fig. 1, these extra tools being driven by the shaft 37.

The above described mechanism could advantageously be incorporated in a sanding machine of known type arranged to sand by means of the tool A the crown *a* of a hat constituting the work B, this hat including a brim *b* (see Fig. 7). This hat B is placed on the support D (block or form) fixed to the output shaft of a lathe N known per se called "oval turning lathe" which is supported on a stand P in the same way as a mechanism Q adapted to drive the sanding mechanism M.

The relative movements of the tool A and the hat B are obtained, firstly, by means of movements of the support D under the action of the oval turning lathe N which presents all the oval sections of the crown *a* parallel to the brim *b* in suitable direction and speed before the tool A and, secondly, by means of the movements of the mechanism Q which presents this tool A before the various radial sections perpendicular to the brim *b* of the hat.

The machine comprises, furthermore, various mechanisms for the control of the sanding pressure and accessories for the automatic starting and stopping, and return to initial position, which will not be described, since they are well known and lie outside the scope of the present invention.

The sanding mechanism M and the sanding machine including this mechanism allow the sanding of the crowns *a* of hats B and of course any similar articles. The sanding operation may be replaced by any other finishing operation merely by changing the abrasive band 18 for any other suitable band which may be in cloth or felt that is dry, greasy, or soaked in coloured or softening powders, or in sharks' skin, etc.

In the case of sanding hats, the brim *b* also needs to be sanded. This may be carried out for example on the sanding machine represented in Figs. 8 and 9.

In this embodiment, the machine comprises above a stand 71, a casing 72 provided with a horizontal table 73. On this table are disposed, side by side, an oval turning lathe mechanism N^1, and a sanding mechanism M^1.

The oval turning lathe mechanism N^1 comprises a carriage 74 movable on the table 73 and connected, by means of a connecting rod 75 and a lever 76, to a shaft 77 which is journalled in the casing 72 and which carries, outside this casing 72, an operating lever 78. In moving this lever in the direction of arrow f^5, the oval turning lathe may be caused to separate from the sanding mechanism M^1.

The carriage 74 carries a bearing 79 in which is journalled a worm 80 slidably keyed on a shaft 81. This shaft 81 is connected, by means of a coupling 82, to a shaft 83 disposed in the mechanism M^1 and driven in rotation, through the medium of a pulley 84 and a belt 85, by a pulley 86 secured to the shaft 87 of a motor 88. This motor, housed in the lower part of the casing 72, is mounted on a support 89 that is adjustable in a similar way to that described for the support 28 of the motor in the first example.

The worm 80 is in mesh with a worm wheel 90 keyed on a shaft 91 which operates the oval turning lathe mechanism 92. This mechanism of well known design, is connected, through the medium of an anti-vibration support 93 to a horizontal plate 94 which carries the support or form D^1 upon which is engaged the crown *a* of the hat B whose brim is being sanded. The plate 94 is horizontal and the lathe N^1 is arranged so that the brim *b* is displaced in the horizontal plane J—J by a movement having a substantially uniform speed.

Inside the carriage 74, the shaft 91 carries another worm 96 in mesh with a worm wheel 97 keyed on a shaft 98b carrying devices 98a, known per se, adapted to bring about the automatic stoppage of the machine after the hat has undergone one, two, three, or four rotations.

The mechanism M^1 is disposed above the table 73 in the upward extension of the stand 72. It comprises two superposed tools constituted by two drums A^1 and A^2 tangent to each other in the horizontal plane JJ. Each of these drums is combined with two driving devices which enable it to be given rapid oscillatory movements about the corresponding horizontal axis V^1V^1 or V^2V^2, and a slow uniform movement of rotation about the same axis. These two devices are, moreover, interconnected as will be explained hereinafter.

The upper tool and its driving devices will be described first. The drum A^1 is fixed to the end of a shaft 98 rotatively mounted in a vertically movable carriage composed of the combination of a first bearing 99, a plate 100 engaged in an annular groove in the shaft 98 so as to be longitudinally held thereto, a slide 101 and bearings 102, 103 and 103a. These various members are connected together and the unit is guided in the vertical direction in a fixed frame 104 (Figs. 8 and 9) which includes a slide-way 104a for the slide 101.

On the shaft 98 is keyed a first sun wheel 105 of a differential mechanism including epicyclic gears. The second sun wheel 106 is keyed on a shaft 107 disposed coaxial with the shaft 98 and journalled in the bearings 103 and 103a of the carriage.

With these sun wheels 105 and 106 mesh planet wheels 108 freely mounted on a spindle 109 fixed to a planet wheel support composed of a ring 110 and two shells 111 centred on the cylindrical skirt portions of the sun wheels 105 and 106.

Means are provided for driving at different speeds the rim 110 and the sun wheel 106 so as to impart to the tool A^1 two superposed movements, one a rapid oscillation, and the other a uniform slow rotation about the axis V^1V^1.

The rapid oscillatory movement is obtained by driving the bevel wheel 106 by means of a driving device. This driving device is constituted by the shaft 107 on which is keyed a lever 112 which in its mid-way position, represented in Fig. 8, is vertical. The lower end of the lever is jointed at 113 to the end of a connecting-rod 114 which in its mid-way position is horizontal, its axis being situated in the plane JJ tangent to the two drums A^1 and A^2. This link is operated by a crankpin 115 (Fig. 9) forming part of a crankshaft 116. This shaft, which is journalled in bearings 117 secured to the frame, is driven in rotation by a motor 88 through the medium of a step-up gear comprising a pulley 118 keyed on this shaft, V-belts 119, and a pulley 120 fixed to the pulley 86 and keyed with the latter on the shaft 87 of the motor 88.

The slow movement of uniform rotation of the tool is obtained by driving in rotation the ring 110. To this end, this ring 110 includes peripheral teeth 121 which mesh with a worm 122 connected to, or forming part of, a shaft 123. This shaft carries at one of its ends a worm

wheel 124 which meshes with a worm 125 provided on a vertical shaft 126 (Figs. 8 and 9). This shaft is driven, through a worm wheel 127 and a worm 128, by the shaft 83 hereinbefore mentioned and which, although belonging to the mechanism M^1, also drives the oval turning lathe N^1.

The driving mechanism for the lower drum A^2 is similar to the above described mechanism, except that it is fixed in height. This mechanism, the outside of which is represented in Fig. 8, will not be described again except that it should be mentioned that the ring 110^a pertaining to this mechanism, is driven in rotation by means of the vertical shaft 126 through a worm 125^a in mesh with the worm wheel 124^a, whereas the second bevel wheel is driven in rotation by means of a lever 112^a connected to a connecting-rod 114^a jointed to a second crankpin 115^a of the crankshaft 116.

It will be observed that the crankpins 115 and 115^a have the same throw and are angularly spaced about the axis by 180°.

Under the action of the vertical shaft 126, which drives the two rings 110 and 110^a, the sun wheel 105 pertaining to each drum A^1 or A^2 is driven with a slow uniform movement of rotation about the horizontal axis V^1V^1 or V^2V^2, and superposed on this movement of rotation is a more rapid movement of oscillation imparted to the second sun wheel 106 pertaining to each drum through the medium of the crankshaft 116, the connecting-rods 114, 114^a and the levers, 112, 112^a.

The two drums A^1 and A^2, while undergoing a slow uniform rotation which causes their abrasive bands or like members in contact with the upper and lower faces of the brim *b* of the hat B to pass over these faces, are subject, about their respective axes, to an oscillation of the same frequency and amplitude but with a phase lag of 180°. These are the rapid oscillatory movements which ensure the sanding or similar operation, the slow, uniform, movement of rotation causing portions of the abrasive surface to pass successively over the area of work.

Owing to the fact that the connecting-rods 114 and 114^a are, in their mid-way positions, situated in the horizontal plane JJ tangent to the drums A^1 and A^2, the action of the connecting-rod 114 on the lever 112 is applied in said plane, i. e. perpendicularly to the slide 101 along which the carriage carrying the upper drum A^1 is movable. The action of this connecting-rod has therefore no vertical component capable of provoking a vertical reciprocatory displacement of the carriage carrying the drum A^1, and the pressure exerted by this drum on the drum A^2 is not disturbed by the action of this connecting-rod 114 as would be the case if the mid-way line of action of this connecting-rod were inclined with respect to the slide 106.

The machine includes means permitting the pressure of the drum A^1 on the drum A^2 to be adjusted and, furthermore, permitting the upper drum A^1 to be lifted in opposition to the force of gravity or of other pressure means and separated from the drum A^2 for purposes of introducing or removing the work B.

To this end, the carriage supporting the drum A^1, under the action of the force of gravity, bears against a vertical rod 130 movable along the casing in which it is guided. This rod is jointed at its lower end at 131 to a link 132 which connects two levers 133 and 134. The lever 133 is pivotally mounted on a fixed pin 135 and is integral with a pedal 136. The lever 134 is pivotally mounted on another fixed pin 137 and is integral with a bar 138 outside the casing and on which is adjustable in position a counterweight 139. It is clear that, depending on the position of this counterweight 139 on the bar 138, the latter can be made to pivot either in the direction of arrow f^6 or in the opposite direction, the action of the counterweight adding to or subtracting from the action of the weight of the drum A^1 and its conjugate members.

When the pedal 136 is urged in the direction of arrow f^7, the rod 130 is, through the medium of the lever 133, and the link 132, caused to rise and with it the drum A^1 and the movable unit of which it forms part.

A device is, moreover, provided to separate the drum A^1 automatically from the drum A^2 when the mechanism N^1, carrying the work B, is separated from the mechanism M^1.

Under the carriage 74 of the mechanism N^1, is rigidly fixed a bar 140 on the upper face of which is provided a notch 141 forming a cam. A roller 142 carried by the rod 130 is adapted to roll in this notch, the latter being arranged so that, in the illustrated position, the roller 142 is free in the bottom of the notch.

The machine is completed by a device ensuring an efficient lubrication of the various rotative members. To this end, there is provided a gear pump 143, having gears 144 (Fig. 8) driven in rotation by the shaft 83 through the medium of a worm 145 and a worm wheel 146 fixed on the shaft 147 of the pump. This pump, which draws the lubricant from the bottom of the compartment containing the driving mechanisms for the drums A^1 and A^2, pumps the lubricant through a vertical pipe 148. A branch pipe 149 leads off from this pipe 148 at the level of the crankshaft 116 and communicates with a passage 150 provided in the latter. The pipe 148 is upwardly extended and terminates in an outlet at 151 at the upper end of the machine whence the lubricant flows and lubricates all the devices.

One cycle of operations necessary for the sanding of the brim *b* of a hat B would be as follows:

The hat is placed on the form D^1 carried by the plate 94. The operator steps on the pedal 136 which, through the medium of the rod 130, raises the drum A^1 and the mechanism of which it forms part. He continues to maintain the drum A^1 in this raised position until the brim *b* of the hat is entirely located between the two drums A^1 and A^2, whereupon he releases the pedal 136 and starts up the motor 88 by pressing the button of a normal control switch box, not shown in the drawing.

The two drums A^1 and A^2 are then subject to rapid oscillatory movements about their respective axes, these movements being at the same speed, and the brim *b* of the hat is sanded. Simultaneously, under the action of the triple-reduction gear comprising the worms 125, 125 or 125^a and 122 or 122^a and the corresponding worm wheels 127, 124 or 124^a and 121 or 121^a, the two drums A^1 and A^2 rotate slowly about their respective axes. The portion of each abrasive member in contact with the brim of the hat is continuously renewed, and the sanding or like treatment of the brim of the hat is thus effected in a uniform manner.

While the drums A^1 and A^2 undergo these movements, the hat, driven by the oval turning lathe 92, revolves whereby the whole of the surface of its brim is subject to action of the drums. After one, two, three, or four complete revolutions of the hat, the motor 88 is automatically stopped, and the operator has merely to step on the pedal 136 and pull the lever 78 towards him for the brim of the hat to be disengaged from the drums, whereupon he removes the hat and places another in position and recommences the cycle of operations.

The invention is not limited to the details of construction herein described and illustrated in the accompanying drawings which have been given merely by way of example. Thus, in the two illustrated embodiments of the invention, the tools are constituted by rotative drums but it is obvious that these drums could be replaced by any other members capable of effecting a similar operation; for instance, discs may be employed which would be subject to both a slow uniform movement and rapid oscillatory movements about their respective centres.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. A mechanism for surfacing articles in for example felt, comprising in combination a frame, a rigid support movably mounted in this frame, an abrasive member for surfacing said articles which is fixed to but removable from this support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, two driving devices drivingly connected to said support, the first driving device being adapted to impart to said support a high speed small amplitude alternating movement for moving said abrasive member over the article to be surfaced, and the second driving device being adapted to impart to said support simultaneously with said first driving device an uninterrupted movement at a low speed in relation to that of said alternating movement for constantly changing the portion of said abrasive member utilized in said area of contact between the abrasive member and the article to be surfaced.

2. A mechanism for surfacing articles in for example felt, comprising in combination a frame, a rigid cylindrical support so mounted on this frame as to be rotatable about and slidable in the direction of the geometric axis of the support, an abrasive member for surfacing said articles which is fixed to but removable from this support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, two driving devices drivingly connected to said support, the first driving device being adapted to impart to said cylindrical support rapid movements of reciprocation along said axis and rapid movements of oscillation about said axis whereby all points on said available surface of the abrasive member describe identical trajectories of small amplitude, and said second driving device being adapted to impart to said cylindrical support simultaneously with said first driving device an uninterrupted movement of rotation about said axis at a low speed in relation to that of said oscillations and reciprocations.

3. A mechanism for surfacing articles in for example felt, comprising in combination a frame, a hub rotatively mounted in this frame, a first shaft rotatively mounted in and coaxial with this hub, a cylindrical drum rotatively and slidably mounted on and coaxial with said hub, an abrasive member for surfacing said articles which is fixed to but removable from said drum, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, at least one second shaft radially disposed relative to said first shaft and mounted to rotate about its own axis in said hub, gears connecting said first shaft to said second shaft, an eccentric portion provided on said second shaft and operatively connected to said drum, and means to drive said hub and said first shaft at different speeds.

4. A mechanism for surfacing as claimed in claim 3, in which a plurality of second shafts are radially disposed relative to said first shaft and mounted to rotate about their respective axes in said hub, said second shafts being so arranged that the centres of their eccentric portions always lie in a plane perpendicular to the axis of said hub.

5. A mechanism for surfacing as claimed in claim 3, in which said eccentric portion provided on said second shaft comprises a crankpin eccentric with respect to the axis of said second shaft and this crankpin is mounted in the inner ring of a ball bearing, the outer ring of this ball bearing being mounted in said cylindrical support in a recess radially disposed with respect to the axis of the latter.

6. A mechanism for surfacing articles in for example felt, comprising a frame, a hub rotatively mounted in this frame, a shaft rotatively mounted in and coaxial with this hub, a cylindrical drum rotatively and slidably mounted on and coaxial with said hub, an abrasive member for surfacing said articles which is fixed to but removable from said drum, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, at least one second shaft radially disposed and mounted to rotate about its own axis in said hub, gears connecting said first shaft to said second shaft, an eccentric portion provided on said second shaft, and a motor having a driving connection with said first shaft and a driving connection with said hub, the latter connection being through the medium of a speed reducer.

7. A mechanism for surfacing as claimed in claim 6, in which means are provided for disengaging or engaging as desired the driving connection between said speed reducer and said hub.

8. A mechanism for surfacing articles in for example felt, comprising a frame, a hub rotatively mounted in this frame, a first shaft rotatively mounted in and coaxial with this hub, a rigid cylindrical support rotatively and slidably mounted on and coaxial with said hub, an abrasive member for surfacing said articles which is fixed to but removable from said cylindrical support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, at least one second shaft radially disposed relative to said first shaft and mounted to rotate about its own axis in said hub, gears connecting said first shaft to said second shaft, an eccentric portion provided on said second shaft and operatively connected to said cylindrical support, a speed reducer comprising a casing pivotally mounted on said frame, an input shaft and an output shaft operatively connected by speed reducing means and rotatably mounted in said casing, said output shaft being adapted to be operatively connected to said hub, means for pivoting said casing so that said output shaft may be operatively connected with said hub or be disconnected therefrom, and a motor having a driving connection with said input shaft of said speed reducer and a driving connection with said first shaft.

9. In a machine for surfacing articles such as for example hats, in combination: an oval turning lathe for driving in rotation the article to be surfaced, a mechanism comprising a frame, a rigid support movably mounted in this frame, an abrasive member for surfacing said articles which is fixed to but removable from this support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, two driving devices drivingly connected to said support, the first driving device being adapted to impart to said support a high speed small amplitude alternating movement for moving said abrasive member over the article to be surfaced, and the second driving device being adapted to impart to said support simultaneously with said first driving device an uninterrupted movement at a low speed in relation to that of said alternating movement for constantly changing the portion of said abrasive member utilized in said area of contact between the abrasive member and the article to be surfaced.

10. A mechanism for surfacing articles in for example felt, comprising a frame, a rigid cylindrical support having an axis of rotation movably mounted in this frame, an abrasive member for surfacing said articles which is fixed to but removable from this support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, two driving devices drivingly connected to said support, the first driving device being adapted to impart to said support a high speed alternating movement of

small amplitude for moving said abrasive member over the article to be surfaced, and the second driving device being adapted to impart to said support simultaneously with said first driving device an uninterrupted movement of rotation about said axis at a slow peripheral speed in relation to that of said alternating movement for constantly changing the portion of said abrasive member utilized in said area of contact between the abrasive member and the article to be surfaced.

11. In a machine for surfacing articles such as for example hats, in combination: an oval turning lathe for driving in rotation the article to be surfaced, a mechanism comprising a frame, a rigid cylindrical support so mounted in this frame as to be rotatable about and slidable in the direction of the geometric axis of the support, an abrasive member for surfacing said articles which is fixed to but removable from this support, the available surface for the surfacing operation of said abrasive member being much larger than the area of contact between the article to be surfaced and said abrasive member, two driving devices drivingly connected to said support, the first driving device being adapted to impart to said support rapid movements of reciprocation along said axis and rapid movements of oscillation about said axis whereby all points on said available surface of the abrasive member described identical trajectories of small amplitude, and the second driving device being adapted to impart to said support simultaneously with said first driving device an uninterrupted movement of rotation about said axis at a low speed in relation to that of said oscillations and reciprocations for constantly changing the portion of said abrasive member utilized in said area of contact between the abrasive member and the article to be surfaced.

12. A mechanism as defined in claim 1, wherein said rigid support is cylindrical and is mounted on said frame to be rotatable about the geometric axis of the support, and wherein the first driving device is adapted to impart to said cylindrical support rapid movements of oscillation about said axis, and said second driving device is adapted to impart to said cylindrical support simultaneously with said first driving device an uninterrupted movement of rotation about said axis.

13. A mechanism as defined in claim 1, wherein said rigid support is mounted on said frame to be rotatable about an axis and further comprising a differential mechanism supported by said frame, said differential mechanism including three members, two of which are sun wheels and the other of which is a planet wheel support coaxial with and geared to the sun wheels through the medium of at least one planet wheel, one of said differential members being operatively connected to said rigid support, said first driving device being adapted to impart a movement of oscillation about its own axis to one of the remaining two differential members, and said second driving device being adapted to impart a movement of rotation about its own axis to the other of said two remaining differential members, whereby said rigid support is subjected to two superposed movements, one of oscillation and the other of rotation about the axis of the rigid support.

14. A mechanism as defined in claim 1, further comprising a differential mechanism supported by said frame, said differential mechanism including three members, two of which are sun wheels and the other of which is a planet wheel support coaxial with and geared to the sun wheels through the medium of at least one planet wheel, one of said sun wheels being connected to said rigid support, said first driving device including a crankshaft rotatably mounted in said frame, a lever secured to one of said sun wheels, a connecting rod jointed to said lever and to the crankshaft crankpin, said second device including said planet wheel support, and a motor having a driving connection with said planet wheel support and with said crankshaft, a speed reducer in the driving connection between the motor and the planet wheel support, and a speed increaser in the driving connection between the motor and said crankshaft.

15. A mechanism as defined in claim 13, wherein said rigid support is cylindrical and further comprising a second cylindrical support identical with the first-named cylindrical support and adapted to be rotated and oscillated in identical fashion to the latter, one of said cylindrical supports having its axis of rotation fixed and the other cylindrical support being slidable, means for urging the slidable cylindrical support selectively toward and away from the fixed cylindrical support, whereby the article to be surfaced may be inserted and held between the two cylindrical supports and be surfaced by them on both its sides simultaneously.

16. A mechanism as defined in claim 1, further comprising an oval turning lathe for driving in rotation the article to be surfaced, said lathe being adapted to be movable with respect to said frame, and means for selectively moving said oval turning lathe toward and away from said frame.

17. A mechanism as defined in claim 12, further comprising an oval turning lathe for driving in rotation the article to be surfaced, a second cylindrical support identical with said first-named cylindrical support and adapted to be rotated and oscillated in identical fashion to the latter, one of said cylindrical supports having its axis of rotation fixed and the other cylindrical support being slidable, means for selectively urging the slidable cylindrical support toward and away from the fixed cylindrical support, means for selectively moving said oval turning lathe toward and away from said cylindrical supports, and means for automatically separating said cylindrical supports from each other when said oval turning lathe is moved away from them.

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